REMARKS/ARGUMENTS

Favorable reconsideration of this application as presently amended and in light of the following discussion is respectfully requested.

Claims 1-2, 4-9, and 21-32 are presently active in this case, Claim 1 amended by way of the present amendment.

In the outstanding Office Action, Claims 1, 2, and 4-7 were rejected under 35 U.S.C. § 103(a) as being unpatentable over U.S. Patent No. 4,493,855 to Sachdev et al.; Claims 1 and 7-9 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Publication No. US 2005/0051820 to Stojakovic et al.; Claims 1 and 3-7 were rejected under 35 U.S.C. § 103(a) as being unpatentable over U.S. Patent No. 6,316,167 to Angelopoulos et al. in view of U.S. Patent No. 5,114,529 to Masuyama et al.; and Claims 21-32 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Stojakovic et al. in view of U.S. Patent Publication 2003/0022526 to Vyvoda.

First, Applicants wish to thank Examiner Duda for the November 30, 2006 personal interview at which time the outstanding issues in this case were discussed. During the interview, Applicants presented amendments and arguments substantially as indicated in this response. While no formal agreement was reached, Examiner Duda indicated that the amendments and arguments presented herein appear to overcome the outstanding rejection, but further consideration is needed.

Turning now to the merits, in order to expedite issuance of a patent in this case, Applicants have amended independent Claim 1 to clarify the patentable distinctions of the present amendment over the cited references. Specifically, Applicants' Claim 1 as amended recites a method of preparing a structure on a substrate including preparing a film stack comprising a thin film, a hard mask formed on the thin film and a layer of light sensitive material on the hard mask. Also recited is that the thin film includes monocrystalline silicon,

polysilicon, doped silicon, silicon nitride, silicon dioxide or a low dielectric constant material or a combination of two or more thereof. The hard mask includes a tunable antireflective coating formed within the film stack having a structural formula R:C:H:X, wherein R is selected from the group consisting of Si, Ge, B, Sn, Fe, Ti, and combinations thereof, and wherein X is not present or is selected from the group consisting of one or more of O, N, S, and F. Further recited is forming a pattern in the layer of light sensitive material, transferring the pattern to the hard mask to form a patterned hard mask, and removing the light sensitive material. Still further, Claim 1 recites treating a surface layer of the patterned hard mask after at least a portion of the light sensitive material is removed, in order to chemically alter the surface layer to a depth of at least 10Å, and transferring the pattern to the thin film using the patterned treated hard mask as an etch mask.

Thus, as discussed in the November 30, 2006 interview, Claim 1 has been amended to define the thin film, to clarify that the treatment step occurs after at least a portion of the light sensitive material is removed, and further to clarify that a patterned treated hard mask is used as an etch mask. None of the cited references disclose these features.

The cited reference to Sachdev et al. discloses a lift-off mask process that uses a plasma polymerized organosilicon film to deposit metal on a substrate. As seen in Figures 1A-1H of this reference, the process includes forming a base layer of soluble organic polymer on a dielectric, forming an organosilicon film 7 on the base layer, and forming resist 8 on the organosilicon film. An opening is then etched in the layers 7 and 8, and metal 15 is formed in an existing opening of the dielectric 2. The base layer 6 is then treated with the solvent in order to remove or "lift-off" the barrier film 7. As discussed in the personal interview, the soluble organic polymer layer 6 of Sachdev et al. is cited in the outstanding Office Action as teaching the claimed thin film. However, Applicants have now amended Claim 1 to specify the material composition of the thin film as a monocrystalline silicon, polysilicon, doped

silicon, silicon nitride, silicon dioxide or low dielectric constant material or a combination of two or more thereof. The soluble organic polymer layer 6 used in the lift-off process of Sachdev et al. does not meet this limitation.

Further, even assuming that the base layer 6 of soluble organic polymer can be considered the recited thin film, Applicants submit that a pattern is not transferred to this layer using a patterned treated hard mask as an etch mask, which is also required by Claim 1. Specifically, as discussed in the November 30th interview, the base layer 6 is deposited on a dielectric material 2, and within a contact opening 4 of the dielectric film 2 as shown in Figure 1A of Sachdev et al. The base layer material 6 is then removed from the contact opening 4 and the contact opening is then filled with metal 15 as shown in Figures 1E, 1F and 1G of Sachdev et al. Applicants submit that the removal of the organic polymer 6 from the entire contact opening 4 cannot be read to be a transferring of a pattern to a thin film using a patterned treated hard mask as required by Applicants' Claim 1. The remaining cited references also do not disclose this limitation.

The cited reference to Stojakovic et al. discloses a fabrication process for MTJ devices. A photoresist 72 and antireflective coating (ARC) 70 are used to create a hard mask 42 for forming the MTJ device. The Office Action takes the position that removing the resist layer by ashing the resist layer over the ARC layer will expose the ARC layer to an oxygen plasma, thereby treating the ARC layer. As shown in Figures 7 and 8 of this reference, however, the resist layer 72 and ARC layer 70 are removed prior to etching of the layers 66 and 64. Thus, even assuming that the ARC layer is incidentally treated in the resist removal process, Applicants submit that the ARC layer is not used as a treated hard mask for etching subsequent layers in the MTJ structure as clearly required by amended Claim 1.

Finally, the Official Action cites the combination of Angelopoulos et al. and Masuyama et al. as teaching treatment of a tunable antireflective coating. The Office Action

admits that Angelopoulos et al. does not disclose treating an antireflective coating with an oxygen plasma but again concludes that a conventional oxygen plasma ashing step such as that shown in Masuyama et al. could be used to remove the resist coating in Angelopoulos et al., which would inherently result in treatment of the antireflective coating. As discussed in the November 30th interview, it is Applicants' position that any exposure of the antireflective coating to an oxygen plasma would be purely incidental and would not be a treatment of the surface layer of this coating to chemically alter the layer to a depth of at least 10Å as required by Claim 1. Moreover, even assuming that this treatment is performed, the treated layer is not used as an etch mask as required by Claim 1.

As seen in Figure 10 of Angelopoulos et al., the resist is first patterned by photolithography using the RCHX layer as an antireflective coating. The patterned resist alone is then used to etch an opening in the RCHX layer, the nitride layer, and the substrate. It is only after this entire structure is etched that the resist layer is removed as shown by the final step in Figure 10. Thus, even assuming that the removal of the resist will treat the RCHX layer, this treated layer is never used for etching any structure as required by Claim 1. Similarly, in Figure 11, a resist is first patterned using a BARC layer as an antireflective coating. The patterned resist is then used to etch an opening in the BARC layer and in the oxide layer. Then both the resist and BARC layers are removed before the oxide is used as a mask for subsequent etching of the nitride and substrate layers. Since the resist and BARC layers are removed in a single step before further etching, any incidental treatment of the BARC layer from this removal step would not provide a treated mask that is subsequently used for etching. Thus, even assuming that the RCHX or BARC layers are treated, Figures 10 and 11 of Angelopoulos et al. do not teach transferring a pattern to a thin film using a patterned treated hard mask as an etch mask as clearly required by Claim 1.

For the reasons discussed above, Applicants' independent Claim 1 patentably defines over the cited references. As the remaining dependent claims depend from Claim 1 in this case, these dependent claims also patentably define over the cited references. Nevertheless, Applicants note that Claims 29-32 each recite an over-treatment exposure time of a hard mask after removal of a light sensitive layer. Applicants submit that these claims further distinguish over the cited references.

Consequently, in view of the present amendment, no further issues are believed to be outstanding in the present application and the present application is believed to be in condition for formal allowance. An early and favorable action is therefore respectfully requested.

Respectfully submitted,

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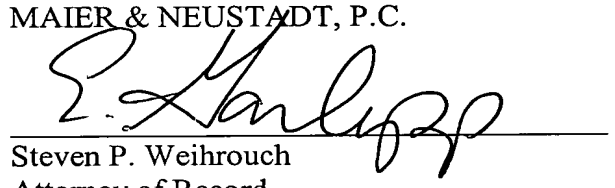

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